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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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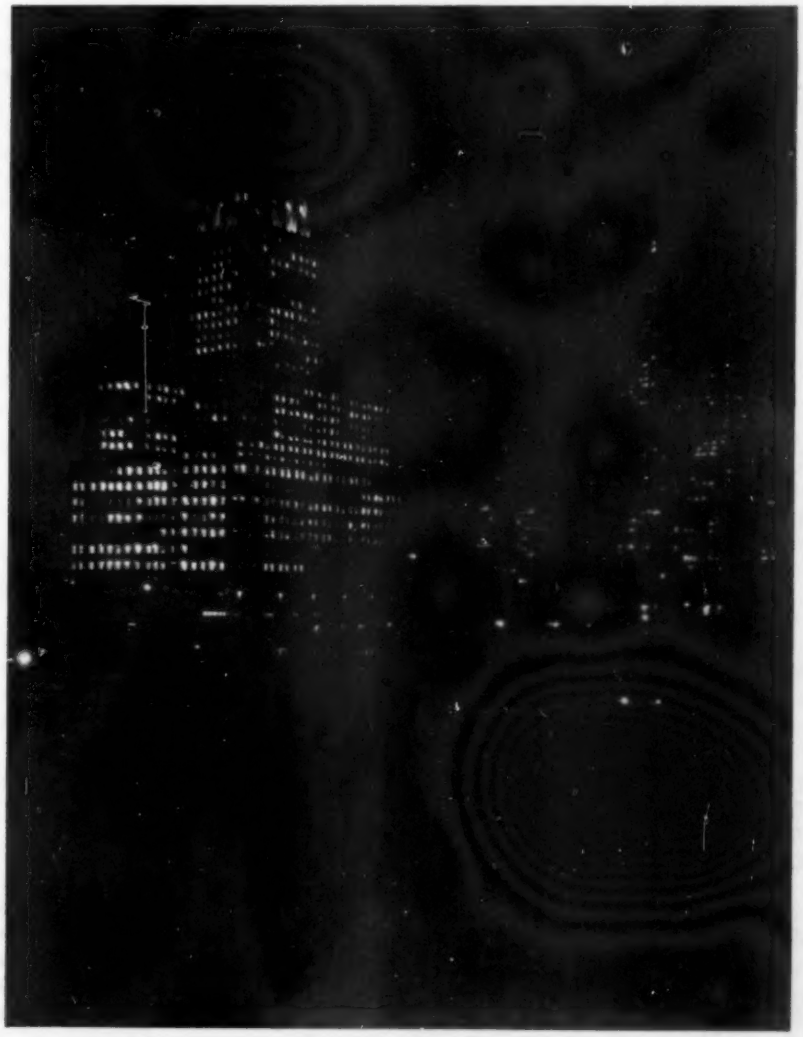

BEYOND ALADDIN'S DREAM

Djinns of a New Generation Make these Palaces Possible

Vol. XIV *No. 389*

Old Mexicans Felt Importance of Man

Archæology

Following are reports of some of the interesting papers presented before the International Congress of Americanists, held in New York during the past week. Others will follow in an early issue.

Mental traits of prehistoric Indian races of Mexico as revealed by their pottery remains, were described by Eduardo Noguera, of the Direction of Archæology of the Mexican Ministry of Education.

Mr. Noguera has made a statistical study of nearly 6,000 pottery samples in Mexican museums, including the art of the potters of the Zapotec, Mixtec, Tarascan, Toltec and Aztec races. This is the first study of its kind made on these civilizations.

The Indians were an intensely religious people, and their art of pottery making, which they carried to a high point of perfection, reflects their mental traits, the archæologist said. The comparative frequency of human, animal, plant, objective and geometrical motives, shows the relative importance to the ancient race of the various creatures or things they represent, Mr. Noguera believes.

The pottery of the Zapotecs of Oaxaca, a race that apparently had certain connections with the Mayas farther south and the Mexican races to the north, shows that the human figure was more important to them than any other form used as a decorative motive, suggesting that the race had left behind the totemic stage of culture and enjoyed the philosophic consolation of believing that the human being was the most important creature on earth.

In the cases of the pottery of the other races here studied, geometrical motives were more important than human ones in determining the shapes and decorations of their pots and idols and other clay objects. Human motives were much more common than animal, while plant motives were rare. Many of the geometrical symbols used on the pottery may, however, be conventionalizations of original natural forms that have lost all semblance to what they once were, he explained. This is true in the conventionalized snakes so well known in Mexican art, whose evolution can be traced from a realistic representation to a purely geometrical form.

Details of the excavation and reconstruction of the most important example of Aztec architecture now known in Mexico, were given by Senor José Reygadas, chief of the Direction of Archæology of the Mexican Ministry of Education.

The site is at Tenayuca, northwest of Mexico City, where excavations conducted by the Mexican government during the last three years have brought to light a great quadrangular pyramid, 236 feet on one side, that once supported a temple for religious worship on its summit.

It was surrounded on three sides by a low wall of coiled snakes that still bear flecks of their ancient red, blue and green paint.

Tenayuca was known, long before the Conquest, to have been the political center or capital of the Chichimecas, a once powerful Indian race. A number of the conquistadores and early padres mentioned it when they wrote home or compiled their memoirs for posterity.

Although it was early covered with earth to protect it from destruction at the hands of the white man, the existence of this mound was always known. In 1914 Dr. Manuel Gamio, seeing that it was fast being destroyed by the villagers of Tenayuca who were extracting the already cut stone for building material, declared it an "archæological monument" and no more destruction was allowed there.

Excavations were begun in 1925, and first the west side of the mound was cleared, showing a stairway of enormous proportions. The upper part of the stairway did not correspond to the lower, as it was set farther back and had a different inclination, and it was soon seen that it was a matter of one stairway superimposed on another at a later epoch. The outside stairway had been so destroyed that it no longer reached all the way up. Eventually the earth was taken out from between the two stairways so that the types of structure of the different epochs could be seen.

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All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

Does Polar Exploration Pay?

Geography

By Edwin E. Slosson

What practical benefits will the man in the street get from Byrd's flight to the South Pole?

None.

The reason is because the South Pole is of no more importance than any other place on earth and less than most places. The pole is merely the point where all the lines of longitude meet and all the lines of latitude vanish. To reach the point where these imaginary lines meet is an imaginary triumph. It has no more interest from a scientific standpoint than the point where the line of longitude and the line of latitude cross in your home town. Not so interesting in fact, because you are there as well as your fellow townsmen, and "the proper study of mankind is man." Also there are innumerable other living creatures in your vicinity, millions of them, large and small, plants and animals, all of significance to the scientist, not to mention the ground you tread on. A single square mile hereabouts would provide more study material for the botanist, zoologist, mineralogist and all the others that end in *ist* than could be got from ten thousand square miles about the pole. There is nothing but ice and air. The ice is the same as that in your refrigerator only more of it. The air is the same as that at home only colder and blowing harder.

The explorer does not himself know just when he gets to the Pole and afterwards he has a hard time proving to the world that he did get there. Some people still believe that Cook got to the North Pole, some are unconvinced that Peary got there. From a scientific point of view it makes no real difference if either or neither of them got there since "there" is only a mathematical point.

There is nothing at the Pole, not even a pole. I say this because I do not believe it, although I know it is true. The reason I do not believe it is because as a child I learned my geography from a globe, which is lots less misleading than learning it from a flat map, or especially a Mercator map. But my map had really truly poles sticking out at the north and south, the ends of a brass rod, the axis on which the world revolves. Later I was informed by my teachers that this notion was one of the childish things I must put away but I have never been able to do it. Whenever I think of the Pole I see that brass rod sticking up and must confess that I cannot yet actually understand how the world can rotate on its axis if the axis is an imaginary line.

But the attention of the scientist is turned towards the poles as if he were magnetized like the needle of a compass. He is always attracted by the unknown. Children are afraid of the dark: scientists are drawn to it. It is the fascination of the unknown. A blank space on the map hurts the eyes of the geographer. The Antarctic is the largest blank space remaining on the map and therefore it is the center of intensest interest. It is felt as a disgrace that a continent larger than the United States should remain so far into the twentieth century unexplored.

When the newspaper reader hears that the Byrd expedition to the South Pole is likely to cost a million dollars, he wonders if it will be worth it. Of course it will. A million American people will get more than a dollar's worth of enjoyment in reading about it and thinking about it and talking about it. I have already got more than my dollar's worth out of the expedition before it started, and I have not paid a cent. If each one of us should send to the Byrd Committee in money order or postage stamps the value in his own estimation of what he will get out of it they would not have to bother about raising funds. The motion picture rights that we get out of the three Antarctic expeditions this year will alone be worth more than we shall pay. The antics of the penguins are funnier than any Mack Sennett farce.

Then again polar exploration is worth much to the world as a demonstration of human endurance, enterprise and self-sacrifice. Don't you remember that talk on "Courage" by Sir James Barrie, Chancellor of St. Andrew's University, Scotland. Barrie drew from his pocket and showed the students Scott's last letter, written from the tent where the party made their last stop, stormbound by the blizzard, without fuel and food, knowing that they had failed to be the first at the South Pole, and that they could not hope to reach home but revealing an unfaltering spirit of fortitude.

The text for another commencement address, if the speaker could equal Barrie, may be found in the last act of Amundsen who gave his life for his enemy, when he gallantly went to the rescue of Nobile, shipwrecked somewhere on the Arctic ice sheet.

The scientist is quite justified in saying to the public or his patrons, "Give me money for investigation and the world will be well recompensed," but if he is wise he will not attempt to say when the dividends on the investment will be paid, or in what coin or to whom. On the whole and in the long run scientific research pays, even in the narrowest pecuniary sense of the word "pay", but which particular line of experimentation will prove profitable in any sense of the word, canot usually be told in advance. If one experiment out of a hundred turns out successfully, the experimenter may think himself lucky. Edison tried out 6,000 kinds of vegetable fibers to find one suitable for the filament of his incandescent lamp and the best he could find, bamboo, was so poor that it was later discarded.

The point to the argument for scientific research is that a "discovery" is a discovery. A man who met a friend starting out into the country with a gun asked him:

"Where are you going?"

"I'm going hunting," answered the man with the gun.

"What are you hunting?"

"How can I tell until I find it?"

So the scientist who is out gunning for a new fact never knows quite what he will find until he finds it, otherwise he would not have to hunt for it. For he would know what he wants to know beforehand.

The primary motive of Arctic exploration was commercial interest. Henry Hudson was in search of a north-west passage to India when he ascended Hudson River and entered, never to leave, Hudson Bay, Later the sport element came to prevail and the race for the pole absorbed the attention of the world. The desire of one particular person to be the first (*Turn to page* 179)

Are you blindly groping for words to fit your thoughts?

"What word conveys the exact shade of meaning I desire?"
"Is there a better word than the one I am using?"
"What is that word I have forgotten?"
"Is there a word in the language which expresses my thought clearly?"
"How can I avoid this constant repetition?"

STRANGE, isn't it, with all the marvellous wealth of our English language that you should find yourself groping blindly for the answers to such word questions as those above.

Strange, with a language so full of expressive words, that it should be so difficult to find the ones that express your thoughts clearly.

With more than 150 words describing various shades of beauty, or over 400 words denoting various degrees of goodness, for instance, why should it be so hard to find the best one for your purpose?

Yet it is not strange either, when you consider that dictionaries are arranged on the assumption that you know all of the more than 200,000 words in the language and seek merely their definitions—that all attempts to make the language available stopped with merely listing the words by ideas, and then not always in alphabetical order.

No wonder the average working vocabulary is less than 2500 words—that you find it so difficult to express your thoughts and your most powerful ideas become mere vague impressions in the minds of your listeners or readers.

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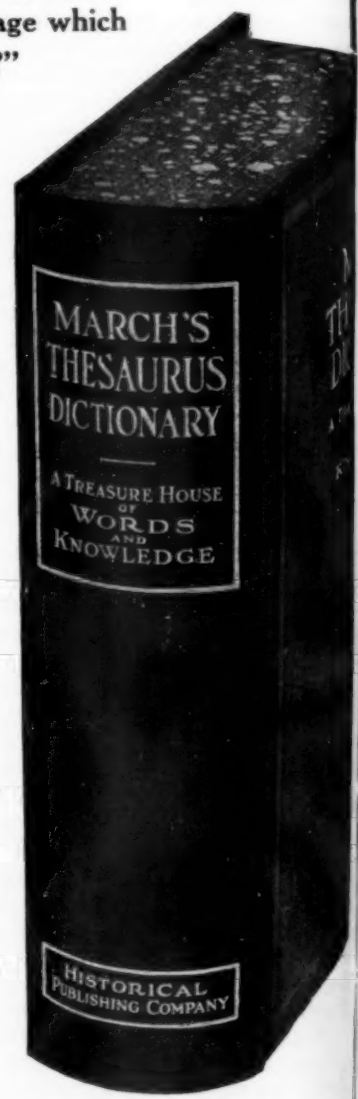

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Planes Beat Birds

Aviation—Ornithology

Announcement by the National Aeronautical Association that it has accepted as the official non-stop record for airplanes the 4,736.7 mile hop of the late Italian aviator, Arturo Ferrarin, from Rome to Brazil, means that another record, hitherto held by birds, has been smashed.

Previously the record stood at 2,895.97 and was held by Edzard of Germany. According to records which ornithologists consider indisputable, he had been outdistanced more than 1,000 miles by a giant albatross that flew 4,000 miles from the Crozet Islands to Rottnest Island, off the coast of Australia, carrying about its neck a frantic message from thirteen shipwrecked sailors.

Proof that the bird had not alighted on the sea to seek food was established by the fact that a wire, holding the message about its neck, was too tight to permit it to swallow. When found, it had choken to death on a herring.

Comparison of other figures, submitted by the Aeronautical Association and by Dr. T. S. Palmer, of the U. S. Biological Survey, shows that the speed and altitude records of birds have been smashed too. Lieut. C. C. Champion, United States Navy, holds the altitude record, 38,418 feet, while the highest a bird is known to have flown is 20,000 feet. The speed record for airplanes is 278.48 miles an hour, held by Warrant Officer Bonnet, of France. Dr. Palmer is of the opinion that birds never go more than 60 miles an hour except in a terrific gale.

He points out, however, that birds are not trying to break records and do not go in for stunts. Their flights are "strictly business". When it comes to precision flying, he adds, birds can fly circles around any aviator; they never lose their bearings and do not require instruments.

Science News-Letter, September 22, 1928

Tree Holds Seed 16 Years

Botany

Experiments made at Giant Forest, Sequoia National Park, have shown that the California Big Tree, or *Sequoia gigantea,* sometimes retains its cones for sixteen years before they drop and discharge their seed contents.

The seeds are preserved from weather and fungi by a powdery pigment, which gives them a waterproof and germproof gloss. This pigment when dissolved in water makes a good writing fluid or furniture stain of a rich maroon color.

Science News-Letter, September 22, 1928

Fully Foolproof At Last

Aviation

THE MERRILL AIRPLANE, invention of scientists at the California Institute of Technology, Pasadena, as it was shown at the recent Los Angeles air meet. Unlike ordinary airplanes, the two wings, though rigidly fastened to each other, may be moved by the pilot in relation to the fuselage, around the upper spar of the wing. They are shown here at their lowest angle. The wings being stable in themselves, no stabilizer is needed. Another unique feature is that the wings are not parallel, but the upper slants forward and upward at an angle of four degrees with the lower. These features make the plane virtually foolproof. The danger of stalling is minimized, and it can be landed in a space much shorter than with the ordinary plane

Wire Fence Stops Insects

Entomology

That an ordinary barbed-wire fence may be almost as effective in excluding grasshoppers and other insects as it is in excluding cattle is one of the curious results obtained by Prof. A. O. Weese of the University of Oklahoma in his recent studies of buffalo pastures in the Wichita National Forest. However, it should be added, the insects respect the fence primarily because it is cattleproof.

The fence in question serves to separate an area of moderately grazed typical virgin prairie from an area of grassland which has been seriously overgrazed. Botanists have known for some time that overgrazing of native pastures tends to throw the balance of vegetation towards a drier type than normal. That is, a pasture in the moist region of tall-grass prairie near the Mississippi will be converted by excessive grazing into a pasture composed of plants usually found much farther west, in the region known as the short-grass plains. Thus a straight fence-line will often be found separating groups of plants which ordinarily would be found separated by long distances in nature.

Prof. Weese and his students have been sweeping two such adjacent types of grassland with their nets and identifying the insects caught. In doing this they have discovered that the associations of insects are quite as rigidly distinct on the two sides of the fence as are the associations of plants. What is more, they find that very rarely indeed do the insects characteristic of the drier short-grass group of plants stray over into the more luscious, if unfamiliar, vegetation of the normal prairie.

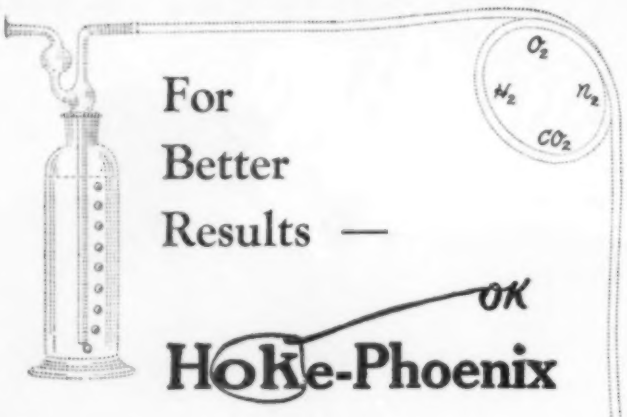
Science News-Letter, September 22, 1928

Quake Off Oregon Coast

Seismology

A sharp earthquake, severe enough to be recorded on seismographs throughout North America, occurred at 7:36 a. m., eastern standard time, on Tuesday, September 11, in the Pacific Ocean about 370 miles off the coast of southern Oregon. This announcement was made by the U. S. Coast and Geodetic Survey as a result of the study of data gathered by Science Service. The exact location of the quake, said the experts of the survey, was at 42.0 degrees north latitude and 131.9 degrees west longitude.

Science News-Letter, September 22, 1928



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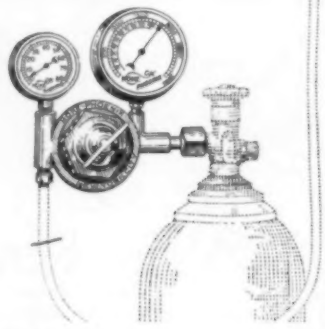

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Models for all purposes, all purses. Some suitable for use with the corrosive gases. Prices, $1.00 to $39.00.

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Shall we send you one of these to try?

This is one of the Hoke glassworking burners. It is a very versatile burner, being suitable for every kind of job, large or small.

With soft glass, use gas and air. Either a large or small flame, either sharp or brushlike, is possible.

With Pyrex glass, use gas plus air and more or less oxygen, as needed.

With quartz, use gas and oxygen.

Shall we send you one to try?

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CAMERA TROPHIES 1928

SPEAKING of adventures—we were bent on getting motion pictures of those wild red foxes 'way over back of farmer Alvord's place, but what a battle of wits we got into! The old lady moved her cubs three times. Twice we were able to follow: then she lost us. Two weeks of work and 180 feet of film—but what film!

Then I perched three hours 60 feet up a sugar maple, concealed under my "magic carpet" blind, and took rarest shot of red-tailed hawk arriving home, mouse dangling from her beak like a princess's pendent ear-ring!

Also this season, up in Nova Scotia, I captured the shy minister gull on my motion picture film, and intimate camera interviews have I had with the osprey.

These **trophies** will be added to the already rich material included in my illustrated platform lecture—**Wild Life Adventures**—a favorite among schools and, I am told, an inspiration to students and teachers alike.

There are other subjects, too, including **Cruising the Canadian Labrador**, a pictorial story about the now famous Greenly Island country.

(Note: Fall and early winter will be spent in the east. Early in 1929 I go to the middle west.)

Let me send you an illustrated circular.

Howard H. Cleaves

1848 Washington Avenue

New York City

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The true radical is a man who thinks you are against him if you can't get as excited as he does.

CLASSICS OF SCIENCE: Michelson on Interference

Physics

LIGHT WAVES AND THEIR USES, *by Professor A. A. Michelson of the department of physics, University of Chicago. The Decennial Publications, second series, vol. III, University of Chicago Press,* 1903.

Before the properties of lenses were known, linear measurements were made by the unaided eye, as they are at present in the greater part of the everyday work of the carpenter or the machinist; though in many cases this is supplemented by the "touch" or "contact" method, which is, in fact, susceptible of a very high degree of accuracy. For angular measurements, or the determination of direction, the sight-tube was employed, which is used today in the alidade and, in modified form, in the gun-sight—a fact which shows that even this comparatively rough means, when properly employed, will give fairly accurate results.

The question then arises whether this accuracy can be increased by sufficiently reducing the size of the apertures.

The answer is: Yes, it can, but only up to a certain limit, beyond which, apart from the diminution in brightness, the diffraction phenomena just described intervene. This limit occurs practically when the diameter of two openings a meter apart has been reduced to about two millimeters, so that the order of accuracy is about $1/5 \times 1/500$ or $1/2500$ for measurements of angle. Calling ten inches the limit of distinct vision, this means that about 1/250 of an inch is the limit for linear measurement. An enormous improvement in accuracy is effected by the introduction of the microscope and telescope, the former for linear, the latter for angular measurements. Both depend upon the property of the objective lens of gathering together waves from a point, so that they meet again in a point, thus producing an image.

It can readily be shown that the luminous point and its image are in the same line with the center of the lens—sufficiently near for the first approximation. Accordingly, if we take separate points of an object, we can construct its image by drawing straight lines from these through the center of the lens, as shown in Fig. 21. The size of the image will be

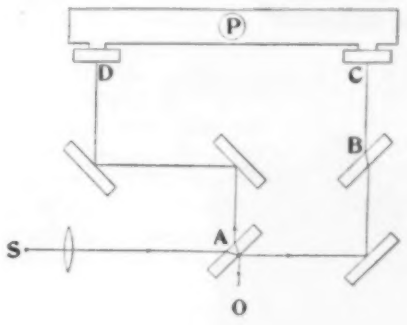

DIAGRAM illustrating the Principles Governing the Michelson Interferometer

greater the greater the distance from the lens, so that the magnification is proportional to the ratio of the distances from object and image respectively to the center of the lens; hence in the microscope an error in determining the position of the image means a much smaller error in the determination of the position of the point source. This error could be diminished indefinitely by increasing the magnifying power, were it not for the attendant loss of light and the fact that the light waves, though very minute, are not infinitesimally small. In fact, the same diffraction effects again limit the possibility of indefinite accuracy of measurement.

In most cases these diffraction rings are so small that they escape notice, unless the air is unusually quiet and the lens exceptionally good. If these conditions are satisfied, and the instrument is focused on a very small or distant bright object (a star or a pinhole in front of an electric arc), the rings are readily visible with a sufficiently high-power eyepiece. They may be much more readily observed, however, if the ratio of diameter to focal length be diminished by placing a circular aperture before the lens. The smaller the aperture, the larger will be the diffraction rings.

In the case of a telescope, the angular magnitude of the diffraction rings, and with this the accuracy of measurement of the position of the luminous point, depends only on the diameter of the objective. . . . The utilization of the two portions of a lens, at opposite ends of a diameter, converts the telescope or microscope into an *interferometer.*

This term is used to denote any arrangement which separates a beam of light into two parts and allows them to reunite under conditions to produce interference. The path of the separated pencils may be varied in every possible way; for instance, by interposing prisms or mirrors, provided the optical paths are nearly equal and the angle between the two final directions very small. The first condition is essential only when the light is not homogeneous. The reason will be apparent when it is remembered that the width of the interference bands depends on the wave-length of the light employed. If the light is composite, as in the case of white light, each component will form interference bands whose width is proportional to the wave-length.

It is important to note that the path of the two pencils after their separation by the first plate is entirely immaterial; for example, either or both pencils may suffer any number of reflections or refractions before they are reunited by the second plate, without affecting in any essential point the efficiency of the interferometer, provided that the difference in the path of the two pencils is not too great, and provided that the two pencils are reunited at a sufficiently small angle.

One type of interferometer has been arranged in such a way as to show the extreme delicacy of the interferometer in measuring exceedingly small angles. For this purpose two of the mirrors, *C* and *D*, have been mounted on a piece of steel shafting *P* two inches in diameter and six inches long. When the length of the paths of the two pencils is the same to within a few hundred thousandths of an inch, the interference fringes in white light are readily observed, or may be projected on the screen. If, now, the steel shafting be twisted, one of the paths is lengthened and the other diminished, and for every movement of one two-hundred-thousandth of an inch there would be a motion of the fringes equal to the width of a fringe. Now, taking the end of the steel shafting between thumb and forefinger, the exceedingly small force which may thus be applied in this way is sufficient to twist the solid steel shafting through an angle which is very readily observed by the movement of the fringes across the field.

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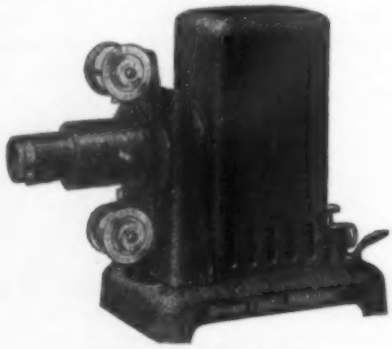

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Fingerprints left by famous painters on their canvases sometimes prove added evidence of the authenticity of a doubtful painting.

A recent discovery of a silk cocoon dating back to 3000 B. C. showed that the silk industry in China is at least 1,000 years older than had been supposed.

The skeleton of a great prehistoric rhinoceros recently found in Russia is so large that a man would reach only to the creature's knee.

Shining tin pans are not such good conductors of heat as tinware that has become dulled by use, according to Cornell University home economics specialists.

Does Polar Exploration Pay?—*Continued*

to reach one particularly inaccessible spot is essentially the same as the desire of the Marathon racer at the Olympic games to be the first at the goal. It attracts the same applause and excites the same personal and national rivalry and jealousy. Incidentally science has gained something by every such expedition, for in the justification of the hazardous enterprise and in the raising of money for it it became increasingly advisable to lay emphasis upon the scientific advantages to be gained. It is impossible, and so fortunately it is unnecessary, to analyze the inner motives of the explorers who have undertaken the conquest of the Poles to determine just what proportion of the instigating impulse was due to the pure scientific spirit of investigation, and how much it was alloyed with the love of glory, fondness for adventure, patriotic emulation and various other influences. Nobody would profess to tell that except a psychoanalyst and he would probably say that men tried to reach the poles because they were too fond of their mothers.

But it is obvious that if the money and effort that had been expended in a dash to the Pole had been used in systematic and unspectacular study of polar regions, the world's knowledge would have been very much greater than it is. Men of science did not protest against the efforts to attain this fictitious goal for the same reason that Mr. Hoover or Mr. Smith does not object when a man votes for him under a mistaken motive. But they openly rejoiced when both Poles were finally reached, not because the attainment had in any way added to the sum of scientific knowledge, but because the removal of this diverting incentive cleared the way for substantial scientific investigation. If polar explorers were not in such a hurry to reach the Pole they could take time to make weather observations and to pick up a few specimens of rock on the way.

We now know that there is nothing at the South Pole except weather and that is bad. A British Consul sent to an interior station in Africa found on the report that he was expected to fill out for the Foreign Office a blank entitled "Manners and Customs" which he filled in "Manners—none; Customs —nasty." Now an anthropologist, out of these mannerless and nasty natives, would have got material for a book weighing five pounds, containing probably a brand new theory of marriage or religion. For not even an Eskimo igloo is to be found in the Antarctic continent although this is larger than Europe or Australia. Accordingly an anthropologist would be useless on the expedition unless he devoted himself to the study of his fellow travellers. The botanist and the zoologist will also have an easy time of it—I mean a hard time of it because they will have difficulty to find anything to work on. Along the edge the botanist can hunt up a few mosses and the zoologist can watch the sea lions and penguins as they climb up from the sea to the edge of the ice, but in the interior there is no life either animal or vegetable.

Still it is from the study of the weather that we may expect the greatest scientific results and perhaps even something of practical value in the sense of pecuniary profit. From observations on ocean and air currents made on the South Orkneys, islands lying above the 60th degree of latitude, it has been found possible to forecast the weather of the Argentine for the coming season. And the crop of Argentine is a large factor in determining the price of wheat in the markets of the world.

In like manner the weather of the Arctic controls the crops of Canada. So it is quite conceivable that a greater knowledge of the climatic conditions of the two Poles would form the basis of a veritable system of long range weather forecasts and so make agriculture less a gamble. In fact I have not seen in the proposals of either of the political parties now contending for the presidency a measure more likely to serve as "farm relief" in the long run than to establish permanent observation stations of the Weather Bureau at the North and South Poles. But no appropriation for my very practical proposal is likely to be passed by Congress because it would be many years before results in the way of weather forecasting could be obtained, and then the benefits would accrue not merely to the American farmer but to all the farmers in the world.

At present weather forecasts are too much restricted in time and space to be of the greatest value. The Weather Bureau dares not prognosticate more than a day or two ahead, and even then the predictions are frequently fallacious. Nothing like the definiteness and accuracy of astronomy, chemistry or physics. The reason for this backwardness of the science of meteorology is because it is long on facts and short on laws. The fault of most sciences at their start has been that speculation ran ahead of the accumulation of data. In meteorology it is the other way around. For scores of years observers have been patiently marking down daily readings of the temperature and pressure of the air and the direction of the wind, but out of this mountain of material very little has emerged in the way of generalized principles applicable to prophecy. This is not due to lack of investigators or to financial support, for all governments do something in the way of weather observation, and there is no branch of research that would bring in more tangible return in the way of financial advantage than this. What little has been accomplished in the way of short term weather forecasts and storm warnings has proved very valuable, but no very general results can be expected until we know more about the movements of the miles of atmosphere above us and particularly the conditions at the Poles, for these regulate the weather of the world.

This point has been put most definitely by the famous Arctic explorer Fridtjof Nansen when he says:

"The circulation of the atmosphere is essentially due to the heating of the air by the solar radiation in the warmer regions of the earth, and to the cooling of the air by the radiation of heat in the colder, especially the polar, regions. To try to find the laws for the atmospheric circulation without knowing the physical conditions of the extensive polar regions, would therefore be somewhat similar to trying to compute the circulation of air in the pipes of a central heating apparatus without knowing the radiators where the heat is given off."

Although the Antarctic continent has for millions of years been destitute of all life, it formerly enjoyed an admirable climate. Fragments of limestone proved to have been built up by the sponges and corals of tropical seas, beds of coal several feet thick, bear evidence of thick forests or swamps. In Jurassic times the south polar continent basked in continual summer like that of Florida or Southern California. Where now it is never summer it was never winter 150,000,000 years ago. At present the great ice-sheet is steadily receding and explorers of later years report less ice and more land on the borders than had been formerly reported.

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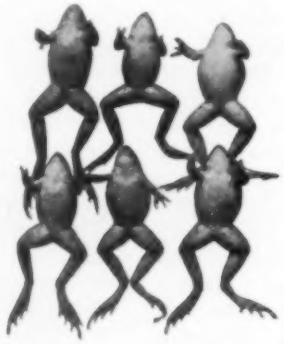

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How to Make Your Own Radiovisor

Radiovision

By C. Francis Jenkins

This is the second of a series of articles prepared for Science Service by Mr. Jenkins in which full directions are given for making a radiovisor to attach to your radio set and pick up the radiomovie and television programs now being broadcast by a number of stations. The next article will appear in next week's issue.

How Radiovision Works

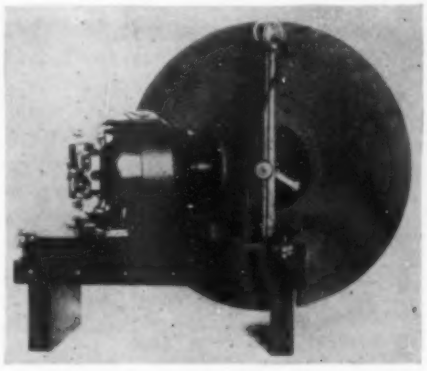
Before you attempt to build a radiovisor you should know some of the principles of radiovision. Seeing by radio is only a little more complex than hearing by radio. In order to make your own radiovisor, as will be explained in this series of articles, you will need to know how the scene or movie being broadcast is changed from a picture painted in light to a series of electrical impulses in the ether and then retranslated into a picture in the radiovisor.

There is nothing mysterious about radiovision. Pictures can be built up for the eye to see just as sounds can be brought together for the ear to hear as speech or music.

The essence of radiovision is the translation of light and darkness into variations of electrical intensity which can be broadcast through the ether and received in any home. Where the microphone of the ordinary sound radio transmitting station picks up sound and translates it into variations of electricity, the eye of the radiovision transmitting station analyses the scene or motion picture before it into strips of fluctuating light and feeds this electrical representation of the scene into a regular broadcasting radio transmitter.

The trickery of the movies is used in radiovision and radiomovies. The eye is satisfied and fooled into seeing motion if fifteen still pictures are flashed on a screen each second. Every motion picture consists of a series of still pictures, each focused on the screen for a mere fraction of a second.

Radiovision also uses the principle that allows photographs to be sent by wire and radio. The photograph or picture to be sent is chopped up into horizontal lines, the number depending upon the quality of picture desired, and the variation of light and darkness along these lines is scanned by an "electric eye" that changes the variations of light into variations of electrical impulses. This electrical eye is called a photo-electric cell. Some scanning device is used to focus the photo-electric cell upon each point of the picture or scene in succession. For the transmission of still pictures of photographs by wire or radio, it is possible to take ten or fifteen minutes to thus cover the picture; for radiovision it is necessary to scan the picture once every fifteenth of a second.



JENKINS RADIOVISOR, rear view, showing mounting of motor and simple friction gearing

The principle of the halftone photograph, such as printed in this publication, that pictures made up of a multitude of small dots are blended by the eye into a smooth picture, is used in radio pictures and radiovision in order that the eye may blend together the horizontal slices of radio photograph, radiomovie or radiovision.

In the radiovision receiver a neon lamp which fluctuates with the changes of the incoming radio impulses allows the scanning disc to recreate the scene or movie that was seen by the eye of the transmitter.

In these articles, a distinction is made between wire-carried service and radio-carried service by the obviously logical terms telegram, telephone, and television, for wire service; and radiogram, radiophone, and radiovision, when referring to radio service. Radiovision means radio transmission and reception of images from living objects and scenes; and radiomovies the transmission of such subjects from a record of them on motion-picture film.

To the present time, the fundamentals of all systems are the same—only the mechanisms differ. And but two methods are employed, i. e., the disc scanner and the drum scanner.

Owing to the limitations of the disc scanner, it may not unfairly be compared to the first audioradio receiver, the crystal set; and because of its greater possibilities, the drum scanner may just as fairly be considered comparable to the three-element tube. The disc receiver is the simpler mechanism and is the one described in the radiovisor you will build; the drum scanner requiring in its construction parts not so easily had.

But both devices scan the picture in the same way, namely, they build up a picture line by line, from left to right, with line distribution from top to bottom, just exactly as you read the lines of type in this column.

Each radiovision picture frame is thus made up of forty-eight lines for quality of detail, and fifteen picture frames per second to get the smooth continuity due to the persistence of vision of the human eye. We are now ready to begin making parts of the radiovisor.

Science News-Letter, September 22, 1928

Observatory Sells Branch

Astronomy

The Chile station of the Lick Observatory, maintained since 1900 in order to observe stars in the southern part of the sky, has been sold to the Catholic University of Chile. This announcement was made by Dr. Robert G. Aitken.

Prof. Ferd. J. Neubauer, who has charge of the Chile station, will remain there until May 1, 1929, as professor extraordinary in the Catholic University.

Science News-Letter, September 22, 1928

Cages Test Borer Control

Entomology

More than a million square feet of copper screening were used in the construction of two gigantic cages which experts of the United States Bureau of Entomology employed in a unique experiment to determine the effectiveness of methods recommended for controlling the destructive corn borer.

The cages were built in a heavily infested region near Toledo, Ohio. Each cage was nine feet high and covered an acre of corn, planted after the soil had been treated to destroy the larvae.

As the moths appeared they collected on the top and sides of the cage, from which they were painstakingly gathered. An actual count was made of the number which emerged, and this count, which has just been completed, reveals that control methods developed by the bureau are more than 98 per cent. effective.

Science News-Letter, September 22, 1928

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Farmers are apt to blame blackbirds and owls for damage to crops really done by rats, says an ornithologist.

Among some African tribes firemaking is an exclusive privilege of men, and the secret is never revealed to women.

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Chemists Invade Field of Vital Products

Chemistry

Following are reports of the meeting of the American Chemical Society at Swampscott, Massachusetts.

How coal and petroleum and natural gas may serve as sources of alcohols was one of the practical questions discussed at the meeting of the American Chemical Society. This does not imply that the chemists disclosed any simpler or cheaper method for the manufacture of that alcohol which is prohibited for sale as a beverage by the Volstead Act, for they were concerned with other and more useful members of the numerous alcohol family, such as those used as solvents in the lacquers which have recently risen in popularity. In 1927 about twenty-five million gallons of these lacquers were manufactured in this country. This is more than ten times the amount produced five years before. They have largely replaced paint and varnish for finishing automobiles and are rapidly invading other fields. They bear different trade names, but consist essentially of dissolved cellulose, made by treating cotton or woody stuff with nitric acid and then dissolving it in various alcoholic and etherial liquids. The preparation of the necessary solvents by the distillation of wood and the fermentation of corn has promoted new industries, but these are now threatened by the possibility of making them cheaper from fossil fuel. Arthur D. Little of Cambridge, Mass., announced the results of the new method of breaking up petroleum as carried on a large scale in the plant at Tiverton, R. I. One barrel of gas oil gives 46 per cent. of motor fuel, five gallons of the higher alcohols and 800 cubic feet of useful gas of which a fourth consists of ethylene.

This gas has recently been found to be a valuable anesthetic and also is extensively used for ripening fruit. Ethylene may also prove an aid to agriculture in another way for certain of its derivatives are found to have the useful knack of speeding up plant growth. Seed potatoes so treated sprout nearly two months earlier than otherwise and in many localities this makes it possible to grow two crops a year instead of one.

Yeast to Replace Beef

Dr. Little hinted at a still more revolutionary change in agriculture in the possible replacement of beef cattle by yeast plants. "Whereas it requires about 100 pounds of foodstuffs to produce three pounds of beef and three acres of land to support a cow, thousands of pounds of solid yeast protein can be developed and separated in a few hours in a very limited space from molasses and many other wastes containing fermentable sugars. That the yeast plant may be given more duties to perform in the near future than making bread and beer is evident from other papers. Dr. Charles E. Bills told of the preparation from yeast of a white crystalline compound called "ergosterol," which is one of the new hard words that the public will have to learn some time, although it is so far unfamiliar even to chemists, and they are not yet agreed on its pronounciation. The British chemists' present accent it on the third syllable and the American on the second. But the newcomer is important, whatever they call it, for it can be converted by the rays of the sun or mercury arc lamp into Vitamin D, which keeps babies from growing up with bow legs and poor teeth. This is the first of the vitamins to be made artificially and is so pure and potent that the addition of one part in a billion of the food will prevent rickets.

Radio Panels From Gas

A new and apparently profitable employment for natural gas was pointed out by T. E. Layng and R. Soukup. Experiments at the State University of Illinois have shown that methane can be easily and quickly and presumably cheaply converted into formaldehyde. Now the raw material, methane, is the chief constituent of natural gas, which runs to waste in some parts of our country as we may see by the flaring torches burning all night in localities needing no illumination. And the product, formaldehyde, is familiar to all of us under the name of "formalin," since it is in common use as a disinfectant. It is equally common, although not so familiar, as one of the two constituents of bakelite used in radio receivers, phonograph receivers, phonograph records and automobiles. The other component of this synthetic plastic is the well-known disinfectant, carbolic acid, obtained from coal-tar. The Illinois investigators get as high as 30 per cent. of the methane transformed by a single passage of the gas, together with oxygen, through a small glass tube heated to a temperature of 690 degrees centigrade and without the need of the high pressure that previous investigators have been obliged to employ. The secret of their success is the use as the catalyst, or combining agent, of a small amount of one of the oxides of nitrogen, the red fumes familiar to every beginner in chemistry. Other compounds produced from natural gas are formic acid and methanol and products in predominant proportions.

Methanol, commonly called "wood alcohol," is employed as a denaturant to render alcohol unfit to drink and some of our citizens have found, to their sorrow, that it is not the same thing as grain alcohol. It used to be made by the distillation of wood, but a few years ago German chemists found out a way of making it from coal and have since been exporting it to America. But if it can be made still cheaper from natural gas we may regain the native industry.

Chemistry Growing Too Fast

The chemical industries suffer from the rapid progress of chemical science. At the Nitrogen Symposium almost all the speakers took occasion to point out that the plants built during the war for the fixation of atmospheric nitrogen for explosives, like that at Muscle Shoals, were obsolete and incapable of competing with processes invented since. In the early and antiquated methods, meaning those of ten years ago, the chief requisite was cheap power. Now cheap hydrogen is more sought.

H. R. Bates of International Agricultural Corporation reported that the world's consumption of inorganic nitrogen for the year ended June 30, 1928, was 1,600,000 metric tons, more than twice what was used in 1913. Of this output nearly a million tons is now extracted from the air by factories. The rest is about evenly divided between the nitrogen obtained from the nitrate beds of Chile and that coming as a by-product of coke ovens. It is a curious situation, and fortunate for us, that there are three independent sources in competition to supply the soldier and the farmer and the family refrigerator with the nitrogen they need, a mineral deposit, a continuous industry, and the fixed nitrogen factory that can be expanded at will.

Chemists Invade Field of Vital Products—*Continued*

How the chemist broke through the barrier between the mineral kingdom and the vegetable and animal kingdoms a hundred years ago, and how far he is likely to go in the production of artificial compounds in the future was the theme of the opening discourse of the distinguished British chemist, Dr. Jocelyn Field Thorpe of the Imperial College of Science and Technology, London, at the first session of the American Chemical Society.

The society meets on the centennial of an epoch-making event in the history of science, the synthesis of urea by the German chemist, Friedrich Wöhler of Göttingen University. This achievement dissipated the ancient superstition that some mysterious vital force was essential to the formation of the foods, flavors, perfumes, drugs and dyestuffs which had hitherto been found only in plants and animals. But when Wöhler in 1828 succeeded in preparing urea, a waste product of animal life, from ammonium cyanate, a well-known salt, the discovery opened the way to the manufacture of an immense variety of useful compounds during the next century, ranging from such dyes as indigo to such medicines as camphor. The latest chemical dictionary describes the making of some 400,000 compounds of carbon. Some of these are to be found in nature, but most of them were not in existence until they were made in the laboratory by chemists following in the footsteps of Wöhler. As to the future, Professor Thorpe says:

"It is pertinent to ask when additions to this already stupendous list are likely to cease. The answer is that it is never likely to cease and cannot cease so long as fundamental research work in organic chemistry is being carried on. These compounds are not, as certain of our maligners suggest, prepared for the sake of preparing them, but are merely steps incidental to the elucidation of some problem of fundamental importance to the progress of science. It is absolutely necessary that these should be recorded in order that subsequent workers in the same field may utilize them as sign-posts indicating the direction along the paths already trodden. In no other way can we hope to explore and map the unknown country ahead of us. I have heard it said that Organic Chemistry is reaching finality, but to those of us who know, the realization that we have only scratched the surface of things is very evident. Many natural substances such as strychnine, morphine and so forth, still evade the skill of the synthetic chemists. The wonderful researches of Willstätter, who has enriched every branch of the science he has touched, have indicated the manner in which the coloring matter of flowers and plants may be investigated."

Yeast Cure Century Old

Yeast as a remedy is nothing new. In a book on brewing, published in the United States in 1815, it was proposed by Joseph Coppinger. At the meeting of the chemical history division of the society, Howard M. Elsey called attention to this now nearly forgotten work.

It is especially interesting, he said, "because of its lengthy discussion of the theory of fermentation at the time of its printing in 1815. Coppinger, though a practical brewer, seems to have been very well read in science and to have had a keen appreciation of the value of research in industry."

Another paper presented before the same meeting told of the chemical experiments that James Madison conducted in the White House while he was President. He wanted to find out a reason for the supposed efficacy of certain Virginia spring waters in the treatment of consumption.

"Madison undertook their analysis according to the analytical technic of his day," Orville E. May told the chemists. "He determined the temperature and relative density of the water and analyzed it for the presence of iron, free acid, sulfide, sulfate, free hydrogen sulfide, copper, ammonia, carbonate and free carbon dioxide. He was prevented from continuing his experiments 'by a sudden alarm to which the frontiers were then continually exposed.'" This "alarm" was due to the British during the War of 1812 arousing the hostile Indians.

Sewers Require Chemists

"Sugar and spice and everything nice" were the original concerns of the chemist, for the earliest chemists were druggists, and dealt in fragrant things. But modern chemistry, which touches every aspect of civilized life, is under compulsion to investigate our very sewers, and though a sewage chemist's nose may be as nice as any other man's, he sticks to his necessary job just the same.

The division of the chemistry of water, sewage and sanitation had its innings at the meeting. Prof. A. M. Buswell of the University of Illinois, with two of his associates, S. L. Neave and A. L. Elder, told of their work in encouraging the digestive processes of the not-too-discriminating bacteria that feed on city waste and reduce it to an innocuous condition.

Following them, Dr. Willem Rudolfs of the New Jersey Agricultural Experiment Station, told of his struggle pollution in the Raritan river, a typical Eastern stream in its load of urban and factory wastes.

Dr. W. R. Copeland of the Connecticut State Water Commission, and Prof. C. R. Hoover of Connecticut Wesleyan University, told of the problems their small but highly industrialized state has to face in the dumping of wastes into its rivers. Paper mills, now among the worst offenders, can be civilized to a considerable extent by recovering the pulp now dumped out with the waste liquor and using the water thus clarified, they said. Textile plant wastes may be treated with iron to form an insoluble sludge, keeping the water clear and chemically sound, and other appropriate chemical means can be used by other industries to restore rivers to their lost decency.

How to Dye Rayon Evenly

Rayon stockings for women or shirts for men can now be dyed more evenly as a result of the discovery of why light stripes sometimes appear even in the best regulated plants. At the meeting of the dye chemistry division, Robert W. Jaeger, of Armour and Co., told of his latest researches.

Sometimes in dyeing rayon skeins, one skein will be found to be much brighter than the others, or if the rayon is woven in the piece with some other material, the lighter stripes will appear. The reason for this is that the offending fibers are not perfectly round, as they should be. Though manufacturing methods have been improved, so that this defect is not as common as it used to be, it still occasionally occurs. Microspopic examination of each fiber to see if it is round is impossible, so that methods have been discovered of making the dye stick even to the uneven fibers. The more acid a dye is, the more evenly it dyes.

England and Wales reported 14,767 cases of smallpox last year, or more than all the rest of Europe together.

The mile-long tunnel that is being bored through solid sandstone in Zion Canyon, Utah, is nearing completion.

Glances at New Books

Prehistoric Man—George Grant MacCurdy—*American Library Association*—($.35). This is one of the very convenient guides to recent books known as the "Reading With a Purpose" series, but it is much more than a mere booklet. It gives in the small bulk of 26 pages a swift and readable survey of what has been found out of the history of the human race for a million years. Those of us who have been mixed up on the order and differences of Mousterian, Aurignacian, Neanderthal, Cro-Magnon, Eolithic, Neolithic, have here a chance to straighten them all out in a few minutes.

Anthropology
Science News-Letter, September 22, 1928

A First Course in Physics for Colleges—R. A. Millikan, H. G. Gale and C. W. Edwards—*Ginn* ($3.72.) Though two of the authors have been known for other physics texts that are among the very best of their kind, this is an entirely new work. Unlike its predecessors, it is intended to cover a course in college of a full year. Prof. Millikan and Prof. Gale have themselves been closely identified with so many of the recent advances in physics that their names are a guarantee of authority.

Physics
Science News-Letter, September 22, 1928

Field Book of Common Ferns—Herbert Durand—*Putnam's* ($2.50). This is a compact, pocket-size manual giving clear descriptions of fifty common fern species of eastern North America, illustrated with clean-cut line drawings and with good photographs showing the ferns in their native habitats.

Botany
Science News-Letter, September 22, 1928

Studies on Scurvy—Arthur W. Meyer and Lewis M. McCormick—*Stanford University Press*—($1.50). Studies made on scurvy in guinea pigs at the Stanford University Medical School are reported, with illustrative plates. The studies covered symptomatology, gross and minute morphology and blood characteristics of the guinea pig in experimental scurvy.

Experimental Medicine
Science News-Letter, September 22, 1928

Water Purification—Joseph W. Ellms—*McGraw-Hill*. The second edition of this valuable and thorough discussion of water purification includes advances during the past ten years.

Sanitation
Science News-Letter, September 22, 1928

To A Triceratops

Palæontology

By Richard Ashman

What lack of pulchritude was yours?
What sheer reptilian homeliness?
Your fossil corpse alone endures,
But it sufficiently assures
Your utter want of comeliness.

An uncouth beast of modern fauna,
Your kith and kin connection,
The fatuous and vain iguana,
Spends hours above a stream, upon a
Limb, admiring his reflection.

Of you, old Tops, no one can claim
Your complex was Narcissine.
You had a decent sense of shame;
Perhaps too much, and thus it came
About you're not for this scene.

When you beheld that frightful face,
And figure, huge and hideous,
As mirrored at some watering place,
The shock applied the coup de grâce
To you, far too fastidious.

Science News-Letter, September 22, 1928

Babies Take Mental Test

Psychology

The young mother's conviction that baby shows intelligence when he puts a pink celluloid ring into his mouth, or when he solemnly says, "Ooh!" is quite justified, for this is just the sort of mental alertness test that psychologists are giving to infants.

A test intended to measure the mental development of babies from one month of age up to one year has been developed by H. E. Linfert and H. M. Hierholtzer, of the Catholic University of America. To find out what the average baby can do at different ages, the psychologists first tested normal babies with a large number of stituations.

At one month of age, almost two-thirds of the babies would grasp a bright pink ring placed at their finger tips. By four months, 98 per cent. of the babies responded to this test of their mental alertness. None of the one-month-old babies tried to put the pink ring into its mouth. At two months, 2 per cent. of the babies had already discovered that this would be a good idea, and at four months of age, 30 per cent. of the babies knew that putting the pink ring into their mouths was a pleasant amusement.

Because of the rapid mental progress of babies, two separate sets of tests were necessary. One set measures babies up to four months, and another set measures babies from six to twelve months.

Science News-Letter, September 22, 1928

Nature Ramblings

By Frank Thone

Natural History

Praying Mantis

Mantis religiosa is the scientific name that has been given to one of the most common species of these weird insects. Proving that entomologists no less than ordinary citizens can be taken in by appearances. For this pious-appearing creature of the summer woods, with its forelegs folded before its face as if in the most devout prayer, is in reality a ravening lion going about seeking what it may devour. The popular title should be changed by one letter, and then it would be correct: preying mantis.

The mantis is one of the most insatiable of all the hunting ogres of the insect world. If you happen to catch one, you can study her ways for yourself. Put her in a wire cage with a few grasshoppers or other fair-sized insects. It will be only a minute or two before she will be holding one of the unlucky hoppers between those pious-looking forearms of hers, while her fierce little conical head chews away at his vitals.

The feminine pronoun has been used here advisedly, for it is ten to one that your captive will be a female. Male mantises don't live long. Among us mortals, a young man about to be married is much pursued by insurance salesmen; but if there were insurance companies in the insect world a young mantis about to mate would be rated as a rather worse risk than a worker in a dynamite factory. For the moment the mating has been accomplished, the female mantis calmly turns her head over her shoulder and begins to eat her spouse. Having made her family biologically possible, he is also drafted for the task of making it physiologically possible. There is no waste in the household management of Mrs. Mantis.

Science News-Letter, September 22, 1928

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